

APPENDIX E  
QUALITY ASSURANCE GUIDE (QAG)  
FOR RETS-EQUIPPED RANGES

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PART I

INTRODUCTION

1. PURPOSE The purpose of the Range Modernization Program Quality Assurance Guide is to provide key personnel (trainers, engineers, safety managers, contractors, project managers) in the Range Modernization Program with an overview milestone guide (checklist format) to Range Planning, Design, and Construction Compliance and Target interface Inspections) which are critical to successful range project development and completion.

2. OUTLINE. The guide is divided into the following parts:

PART I: Introduction

PART II: Planning Guide (Checklist)

PART III: Design Guide (Checklist)

PART IV: Construction/Target Interface Guide (Checklist)

Part V: References

Part VI: Standard Equipment Lists (SEL’s)

Part VII: Range Standard Equipment Matrix Component Calculation Factors

Part VIII: Range Standard Sample Size Matrix

Glossary

3. METHODOLOGY.

a. The Planning Guide (Checklist) is designed to be used by post/installation range program personnel (DPT/Range Officers, Trainers, DEH/Master Planners, Safety) as a guide during the pre-planning and planning phases of the range development process (See TC 25-8, Chapter 4). It is applicable to training requirements/task analysis, site analysis and selection, preliminary documentation (draft range layout, draft DD Form 1391, project development brochure (PDB-1) analysis, and final planning documentation/upgraded range layout, PDB-2, full DD Form 1391 with justification, environmental assessment report, and procurement requests). It is also used by MACOM and RTSD personnel to monitor specific project development.

b. The Design Guide (Checklist) is structured to be used by post/installation range program personnel, Corps of Engineers (Huntsville and appropriate districts), the contractor AE firm, appropriate MACOM, and RTSD personnel in the Design Development (Concept through Final) of a range project.

c. The Construction/Target Interface Guide (Checklist) is designed for use primarily by COE and MCA subcontractors, AMCCOM and target installation contractor, National Guard Bureau (NGB) and RTSD personnel in the construction compliance and target interface inspection phases of a range project.

d. Parts VI through VII provide post/installation range program personnel with a reference guide to the characteristics and targetry hardware quantities associated with each standard RETS range. Included is a summary that includes a matrix of range standard equipment and matrix of component/equipment calculation factors.

e. The Planning, Design, and Construction/Target Interface Checklists (parts II-IV) are designed to “stand alone” and be used in notebook/acetated page format. Range program personnel may use them separately or in concert with each other during the phases of a range project development cycle.

f. Questions concerning content and application of these checklists as program guides should be referred to:

(1) DA Executive Agency:

Commander  
U.S. Army Training Support Center (USATSC)  
ATTN: ATIC-RTSD  
Ft. Eustis, VA 23604-5166

(COMM.) (804) 878-4858; (DSN) 927-4858

FAX Number: (COMM.) (804) 878-4260; (DSN) 927-4260

(2) Executing Agency:

Commander  
U.S. Army Engineering and Support Center, Huntsville (USAESCH)  
ATTN: PM-CR (Vernon Petty)  
4820 University Square  
Huntsville, AL 35816-1822

(COMM.) (256) 895-1534; (DSN) 760-1534

FAX Number: (COMM.) (256) 895-1248

PART II  
PLANNING CHECKLIST

ADMINISTRATIVE DATA RANGE INFORMATION	
1. TYPE RANGE:_____	
2. PN: _____	
3. INSTALLATION: _____	
4. MACOM: _____	
5. CONSTRUCTION COMPLETION DATE (EST):_____	
(MONTH/YEAR)	
REVIEWER INFORMATION	
6. NAME: _____	
7. DATE: _____	
8. POSITION: _____	
9. ORGANIZATION: _____	
10. EVENT: _____	
(Planning Assistance Visit, Site Analysis/Range Layout)	

HOW TO USE THIS CHECKLIST

1. This Range Modernization Program Planning Checklist is provided for use by personnel involved in the range modernization program effort. It is a checklist of common items which should be verified during the pre-planning or planning phases of a range project. Use this checklist in conjunction with reference documents listed in Part V.
- a. The checklist items are divided into categories by paragraph as follows:
- | Category (Area)  | Paragraph |
|--|-----------|
| Pre-Design Planning (PDP) Resource Factors             | 1         |
| PDP - New Range Requirement Justification              | 2         |
| PDP- New Range Construction vs. Existing Range Upgrade | 3         |
| PDP- Range Land and Impact Area Requirement            | 4         |
| Site Orientation and Range Layout                      | 5         |
| Range Development Process-Planning Summary             | 6         |
- b. Each checklist item is marked preferred (P) or required (R) on the checklist. The checklist user should mark the “YES” or “NO” block after each item and write clarifying remarks in the “NOTES” column when appropriate. Required items marked “NO” must be corrected prior to project continuation to the next phase.
2. Proposed users of the Planning checklist are identified but not limited to the following: Post/installation, trainers, DEH (Master Planner), Safety Office, Environmental Office; RTSD Personnel; MACOM Training Support Personnel; NGB.
3. Part VI outlines the type/quantities of RETS hardware equipment associated with each standard RETS range. Each Range Standard Equipment List (RSEL), by type range, has spaces provided for the checklist user to indicate the actual quantity of RETS equipment to be installed on the range project next to the normal quantity requirements. The completed project RSEL provides a verification of target quantities to project managers at various agencies throughout the planning, design, and construction phases of the project.
4. The checklist is designed to be a quality assurance *guide only* and is *not* intended to replace Army publications (ARs, TCs, FMs, CEHNC 1110-1-23) which address key aspects of the range modernization program (see Part V). RTSD personnel will use this checklist in conjunction with the planning phase of assigned range projects.

COMMON CHECKLIST ITEMS (1-6)	P/R	YES	NO	NOTES
1. Pre-Design Planning (PDP) - Resource Factors (TC 25-8, Chapter 4)				
a. Available land vs. training range real estate requirements (firing/maneuver area plus SDZ/Impact Area) analyzed for use; possible sites identified	R			
b. Manpower requirement to operate/maintain proposed range facility identified; manpower available through current/proposed installation range operations personnel or commercial contracting.	R			
c. Funds estimated for project construction and O&M sustainment	R			
d. OPTEMPO resources for weapon systems/unit throughput requirements are considered when selecting range location.	P			
e. Required ammunition authorization quantities identified to sustain projected throughput. IAW DA Pam 350-38	P			
f. Facilities to support/maintain range project on a continuing basis exist or will be available by project IOC date.	R			

P = Preferred; R= Required

COMMON CHECKLIST ITEMS (1-6)	P/R	YES	NO	NOTES
2. PDP - New Range Requirement Justification: (TC 25-8, Chapter 4)				
a. New or modified training tasks cannot be accomplished on existing ranges without changes.	R			
b. Fielding/installation of a new weapon system which requires live fire facilities currently not available at this installation.	+			
c. Installation/new unit(s) mission change requires increased capability to support range training activities.	+			
d. Better management of range facilities or land usage can be accomplished by designated project.	+			
e. Planners consider sharing cost effective use of an existing facility located at another installation.	R			
f. Planners consider upgrade conversion of an older or specialized range to a multi-use range.	R			
G. Planners consider TADSS to meet training requirement prior to range project approval	R			
+ NOTE: ONE of these three conditional factors (2b, c, or d) is usually required for project justification.				

COMMON CHECKLIST ITEMS (1-6)	P/R	YES	NO	NOTES
3. PDP - New Range Construction vs. Existing Range Upgrade: (TC 25-8, Chapter 4)				
<i>Planners should consider the following factors in determining whether existing range facilities can support training requirement changes, current range(s) should be modernized, or new range construction started.</i>				
a. Type and number of existing ranges.	R			
b. Current use/throughput and capacity levels.	R			
c. Address projected usage levels/student load for out years.	R			
d. Operational status/maintenance condition and costs.	R			
e. Primary/alternate uses for each range.	R			
f. Potential new uses.	R			
g. Obsolescence/ammunition limitations.	R			
4. PDP - Range Land and Impact Area Requirements: (TC 25-1, Pg. 28-32)				
a. Commander determines need for a specific type of range to include weapons system(s)/ammunition to be used.	R			
b. Installation determines safety fan for each type weapon. (TC25-1, Page 3-3)	R			

COMMON CHECKLIST ITEMS (1-6)	P/R	YES	NO	NOTES
c. Installation establishes potential impact area for each type weapon and applies cumulative SDZ "footprint" to each proposed site.	R			
d. Selected site uses existing/common impact area, if possible.	R			
e. All rounds fired remain on military property within the impact area.	R			
5. PDP - Site Orientation and Range Layout:				
a. Proposed site uses terrain configuration to reduce SDZ, if possible.	R			
b. GTL does not pass over public roads or navigable waters.	R			
c. GTL oriented to north, northwest, northeast or south; firing positions do not face rising or setting sun.	P			
d. GTL perpendicular to high ground on rough terrain.	P			
e. GTL horizontal or below horizontal on flat terrain.	P			
f. SDZ does not overlap adjacent firing ranges/maneuver areas.	P			
g. Proposed site is free from interference or distraction from adjacent range(s).	P			

COMMON CHECKLIST ITEMS (1-6)	P/R	YES	NO	NOTES
h. Proposed target arrays are IAW weapon system training requirement standards.	R			
i. RETS emplacement quantities are IAW TC 25-8 and CEHNC 1110-1-23 for this type range. Any deviation requires RTSD approval.	R			
j. Control tower position does not impede access to firing line or firing line positions.	R			
k. Support facilities area does not impede access to firing line or firing lane by using unit/vehicles.	R			
l. Proposed tank trails and service road networks provide access to target emplacements for maintenance.	R			
m. There is a minimum of two tank trails per lane (armor ranges only).	P			
n. Proposed site does not jeopardize the existence of threatened or endangered species or destroy or adversely affect critical habitats of such species. Project is sited in compliance with AR 420-74, Natural Resources-Land, Forest and Wildlife Management.	R			
o. Proposed site does not impact on cultural or historic resources. Project is sited in compliance with AR 420-40, Historic Preservation.	R			

COMMON CHECKLIST ITEMS (1-6)	P/R	YES	NO	NOTES
p. use Integrated Training Area Management (ITAM) data to site range if this data is available.	P			
q. Is the proposed site a former impact area?	-			
r. Is the site contaminated with unexploded ordnance?	-			
s. If contaminated, a surface and subsurface clearance in areas where intrusive groundwork is planned is required. Has clearance been programmed?	-			
6. Range Development Process - Planning Summary:				
a. Phase One - Project Initiation.				
1) Select key players.	R			
2) Draft project schedule.	R			
3) Identify assistance sources.	R			
4) Collect resource documents and data.	R			
5) Determine training tasks.	R			
b. Phase Two - Site Analysis/Selection.				
1) Determine type range needed.	R			
2) Analyze task requirements.	R			

COMMON CHECKLIST ITEMS (1-6)	P/R	YES	NO	NOTES
3) Identify candidate sites.	R			
4) Select best site	R			
c. Phase Three - Preliminary Documentation.				
1) Prepare preliminary range layout (user training requirements).	R			
2) Prepare site/perimeter description; coordinate with installation trainer, resource management, engineers/masters, safety, public affairs, provost marshall, environmental officer, other appropriate staff.	R			
3) Add project to Installation Five-Year Range Development Plan (FYRDP) and forward to MACOM range manager.	R			
4) Prepare front page form DD 1391.	R			
5) Prepare Project Development Brochure (PDB)-1	R			
d. Phase Four - Formal Documentation				
1) Upgrade Draft Range Layout to include firing/target positions and SDZ overlay.	R			
2) Prepare PDB-2 and Form DD1391 with justification.	R			
3) Prepare concept design documents.	R			

COMMON CHECKLIST ITEMS (1-6)	P/R	YES	NO	NOTES
4) Prepare analytical/environmental documentation.	R			
5) Prepare procurement request.	R			
6) Coordinate with Resource Management for PARR/MRIS inputs for OPA/OMA resource requirements to support MCA and Non-MCA ranges.	R			

PART III  
DESIGN CHECKLIST

ADMINISTRATIVE DATA RANGE INFORMATION	
1. TYPE RANGE:	
2. PN:	
3. INSTALLATION:	
4. MACOM:	
5. CONSTRUCTION COMPLETION DATE (EST):	
	(MONTH/YEAR)
REVIEWER INFORMATION	
6. NAME:	
7. DATE:	
8. POSITION:	
9. ORGANIZATION:	
10. EVENT:	
	(CDR, IPR, FDR)

HOW TO USE THIS CHECKLIST

1. This Range Modernization Program Design checklist is provided for use by personnel involved in the range modernization program effort. It is a checklist of common items which should be verified during the design phase of a range project. Use this checklist in conjunction with reference documents listed in Part V.

a. The checklist items are divided into categories by paragraph as follows:

Category (Area)	Paragraph
RETS Emplacement Quantities .....	1
Gun-target Line .....	2
Surface Danger Zone .....	3
Training Considerations .....	4
Range Design.....	5
Trails and Service Roads.....	6
Infantry Firing Positions.....	7
Control Tower.....	8
Cable Junction Boxes.....	9
Data Breakout Boxes.....	10
Armor Moving Target (MAT) Emplacements .....	11
Stationary Armor Target (SAT) Emplacements.....	12
Stationary Infantry Target (SIT) Emplacements .....	13
Moving Infantry Target (MIT) Emplacements.....	14

b. Each checklist item is marked preferred (P) or required (R) on the checklist. the checklist user should mark the “YES” or “NO” block after each item and write clarifying remarks in the “NOTES” column when appropriate. Required items marked “NO” must be corrected or resolved prior to project continuation to the next phase.

3. Proposed users of the Design Checklist are identified but not limited to the following: COE (HNC and responsible district, concept through final design); A-E Firm; Post/Installation; DPT/DEH/Safety/Environmental Officer; RTSD Personnel; NGB.

4. Part VI outlines the type/quantities of RETS hardware equipment associated with each standard RETS range. Each Range Standard Equipment List (RSEL), by type range, has spaces provided for the checklist user to indicate the actual quantity of RETS equipment to be installed on the range project next to the normal quantity requirements. The completed project RSEL provides a verification of target quantities to project managers at various agencies throughout the planning, design, and construction phases of the project.

5. The checklist is designed to be a quality assurance guide only and is not intended to replace Army publications (ARs, TCs, FMs, CEHNC 1110-1-23) which address key aspects of the range modernization program (see Part V). RTSD personnel will use this checklist in conjunction wit the design phase of assigned range projects.

COMMON CHECKLIST ITEMS (1-14)	P/R	YES	NO	NOTES
1. RETS emplacement quantities are IAW CEHNC 1110-1-23 and TC 25-8. Any deviation requires RTSD approval.	R			
2. Gun-Target Line (GTL), (TC 25-8, Chapter 4)				
a. GTL perpendicular to high ground on rough terrain.	P			
b. GTL horizontal or below horizontal on flat terrain.	P			
3. Surface Danger Zone:(TC 25-8)				
a. Rising terrain has been utilized to reduce SDZ.	P			
b. Terrain is free of exposed rocks, boulders and other ricochet producing objects.	P			
c. Backstop consists of loam and sandy soil.	P			
4. Training Considerations:				
a. Vegetation is retained but does not obscure targets from firing position.	P			
b. Angle from firing position to targets enables shooters to acquire and recognize targets (infantry)	R			
c. All targets within a lane are visible from the lane firing position.	R			

P = Preferred; R = Required

COMMON CHECKLIST ITEMS (1-14)	P/R	YES	NO	NOTES
d. All designated targets are visible from defilade gunner's position throughout firing boxes (armor).	R			
e. All designated targets are visible from gunner's position throughout firing boxes (armor).	R			
f. Designated Targets in adjacent lanes are visible from defilade positions and firing boxes (armor).	R			
g. Vegetation or terrain provide intermittent concealment of MIT.	P			
h. SITS are oriented to face the firing line when upright.	R			
5. Range Design:				
a. Support facilities meet DD1391 and are IAW CEHNC 1110-1-23 requirements.	P			
b. ITAM data will be used to design the range, if it is available.	P			
c. Natural Resources Considerations:				
1) Threatened and endangered species are not impacted, IAW AR 420-74 by this project.	R			
2) Neither cultural or historic resources are adversely impacted, IAW AR 420-40 by this project.	R			
d. Target emplacements	R			

COMMON CHECKLIST ITEMS (1-14)	P/R	YES	NO	NOTES
meet DD 1391 and are IAW CEHNC 1110-1-23 requirements.				
e. Number of lanes meet DD 1391 and are IAW CEHNC 1110-1-23 requirements.	R			
f. Target arrays and distances meet the requirements of the appropriate gunnery manuals for weapons systems/tables to be used on this range.	R			
g. Infantry targets susceptible to main gun fire are adequately protected by berms. (armor)	R			
h. ITM locations do not exceed ±5 meters variance from required locations.	R			
i. Target emplacements utilize natural terrain to protect equipment without destroying existing terrain characteristics.	R			
j. Overall size and heights of front and side walls of target emplacements are IAW CEHNC 1110-1-23s.	R			
k. Front walls meet the following heights:				
1) SIT = 16 inches. (minimum)	R			
2) MIT = 26 inches. (minimum)	R			
3) SAT = 53 inches.	R			
4) MAT (non-aerial gunnery) = 60 inches above	R			

COMMON CHECKLIST ITEMS (1-14)	P/R	YES	NO	NOTES
sub-base.				
5) MAT (aerial gunnery) = 72 inches above sub-base.	R			
1. Berm thickness will withstand penetration by ammunition to be fired by weapons planned for use on this range. (IAW CEHNC 1110-1-23, chapter 6)	R			
6. Trails and Service Roads: (CEHNC 1110-1-23, chapter 7)				
a. There are a minimum of two tank trails per lane. (armor)	R			
b. Tank trails and/or service road networks provide access to target emplacements for maintenance.	P			
7. Infantry Firing Positions:(CEHNC 1110-1-23.)				
a. Foxholes are provided within each lane at the firing line on small arms ranges.	R			
b. Foxholes are provided at firing positions on collective training ranges.	R			
c. Additional firing positions are provided along firing lane for supporting shooters. (sniper)	R			
d. Foxholes provide clear visibility of targets and facilitate drainage.	R			
e. Designated targets and target arrays are visible	R			

COMMON CHECKLIST ITEMS (1-14)	P/R	YES	NO	NOTES
from downrange infantry firing positions.				
f. Downrange firing positions are sited to take advantage of natural terrain and vegetation concealment.	P			
g. Provisions are made for drainage of downrange firing positions.	R			
8. Control Tower; (CEHNC 1110-1-23)				
a. Size and layout is IAW appropriate CEHNC 1110-1-23.	R			
b. Tower location and height provide clear line-of-sight visibility of firing line from control room (infantry positions.	R			
c. Tower position does not impede access to firing line or firing positions.	R			
d. Work table surface is 36 inches deep by the width of tower minus 36 inches for a free standing printer and has a 2 inch X 12 inch slot for cable access.	R			
e. HVAC is provided.	R			
f. Back wall of control room is windowless.	P			
g. A single point ground (SPG) plate is installed.	R			

COMMON CHECKLIST ITEMS (1-14)	P/R	YES	NO	NOTES
h. Sufficient supports and space are provided for mounting signal distribution assembly (SDA) IAW CEHNC 1110-1-23.	R			
i. A No. 6 AWG insulated ground cable is installed between the SPC and the tower junction box (TJB)	R			
j. A No. 1/0 AWG insulated ground is installed between the SPG and the SDA location (Leave 4 feet of free length)	R			
k. The tower ground is certified by COE contractor to yield earth resistance of 25 ohms or less.	R			
l. A 240-VAC, 1-phase, 2-pole, 20-amp circuit is provided in a junction box located within 3 feet of the SDA.	R			
m. A 2 inch conduit with a pull wire is provided from the TJB to the SDA location IAW CEHNC 1110-1-23.	R			
n. a 4 inch X 4 inch wire way is provided between the SDA and the RCS computer location IAW CEHNC 1110-1-23.	R			

COMMON CHECKLIST ITEMS (1-14)	P/R	YES	NO	NOTES
o. Data cables (type PE-39, 19 AWG, multiple twisted pair (armor) or 6 twisted pair (infantry)) are to be installed leading from downrange to the TJB with 6 feet of free length in the TJB. Cables are to be tagged with permanent tags (adjacent to conduit penetrations) which shows the cable destination.	R			
p. Data cables are free of splices.	R			
q. TJB size, configuration, threaded studs (with collar), and spacing conforms to requirements shown in CEHNC 1110-1-23 TJB drawing. (Collar shall be free of paint, rust and coated with an electrical conductive oxide inhibiting compound.) Provide one nut for each threaded stud.	R			
r. All conduit penetrations of the TJB are waterproof.	R			
s. Pull wires are provided in all empty conduits.	R			
t. Lightning protection meets national Fire Prevention Association (NFPA code 78.	R			
u. Direct burial of data and power cables meet minimum separation requirements, i.e., low voltage = 8 inches; high voltage = 24 inches.	R			

COMMON CHECKLIST ITEMS (1-14)	P/R	YES	NO	NOTES
v. Spare twisted wire pairs will be provided between the TJB and DBBs, and between DBBs.	R			
9. Cable Junction Boxes: (CJB)				
a. All CJB are NEMA-4 boxes IAW CEHNC 1110-1-23.	R			
b. CJB is shown in target emplacement.	R			
c. Data and power cables are installed in CJB (one per opening) with 16 inches of free length inside the box.	R			
d. Permanent tags are attached to the cables (inside the box, directly above the conduit opening) to identify the cable destination.	R			
e. A set of as-built drawings identifying the cable runs is available for the equipment installer.	R			
f. Watertight fittings are provided for all conduit and cable entries.	R			
g. CJB dimensions, configuration, and standoff location and spacing are IAW CEHNC 1110-1-23 CJB drawing.	R			
h. Power cable sizes do not exceed No. 2 AWG-copper, 3 wire with ground and is shielded.	R			

COMMON CHECKLIST ITEMS (1-14)	P/R	YES	NO	NOTES
i. CJB cover holding screws do not penetrate the box.	R			
j. Tops of standoffs are free of paint and rust and are coated with an electrical conductive oxide inhibiting compound. Four screws (1/2 inch long) are provided for the standoffs.	R			
k. All pre-punched holes provided for equipment installer are correct size, properly spaced and sealed with temporary seals.	R			
l. The construction contract specifications shall require the construction contractor to submit a sample CJB (complete with all penetrations, connectors and standoffs) for approval prior to any CJB installation.	R			
10. Data Breakout Boxes: (DBB) (Armor Ranges Only)				
a. DBBs are NEMA-4 boxes IAW CEHNC 1110-1-23.	R			
b. DBB dimensions configuration, threaded studs with collar, spaced IAW CEHNC 1110-1-23. Collar shall be free of paint, rust and coated with an electrical conductive oxide inhibiting compound. Provide one nut for each stud.	R			

COMMON CHECKLIST ITEMS (1-14)	P/R	YES	NO	NOTES
c. Data cables (one per conduit) are installed in DBB with 6 feet of free length coiled inside box.	R			
d. Permanent tags are attached to the cables (inside the box, directly above the conduit entry) to identify the cable destination.	R			
e. Multiple twisted wire pair, PE-39 cable is routed between the TJB and the DBB and between all other DBBs.	R			
f. Six twisted pair PE-39 cable is routed between the DBB and CJBs.	R			
g. A No. 6 AWG bare copper conductor is provided between the DBB and the grounding rod. (Other than MAT emplacements)	R			
h. A 20 amp, 240 volt circuit is provided to the DBB to power a modem (6 feet excess conductor is coiled in the DBB).	R			
11. MAT emplacements:				
a. A 10 foot free length coil of No. 4/0 AWG bare copper conductor is provided from the bunker ground field to the vicinity of the CJB.	R			
b. A spare single-pole, 10 volt, 20 amp circuit breaker is provided in the power panel for the motor starter control circuit.	R			

COMMON CHECKLIST ITEMS (1-14)	P/R	YES	NO	NOTES
c. A 25-30 KVA, 480 VAC, 3-phase isolation transformer for bus bar heater power is provided.	R			
d. The MAT carrier power is supplied from a 480 VAC, 75 KVA, (minimum), 3-phase transformer.	R			
e. Track bed width is a minimum of 144 inches.	R			
f. MAT track grade does not exceed 5.7 degrees (10 percent).	R			
g. The first 60 meters (196 feet) of MAT roadbed (at its powered source end) and the last 40 meters (131 feet) of the track has a grade of 0 degrees $\pm$ 1 percent.	R			
h. The minimum turning radius of curved track is 152.4 meter (500 feet).	R			
i. Conduit (with pull wires) and sufficient space is available for equipment installation IAW CEHNC 1110-1-23.	R			
j. 588 CY of No. 57 ballast shall be stock piled for each MAT track installation. Ballast shall be laboratory tested to determine its maximum compacted density. See page E-15 for information on MAT ballast calculations.	R			

COMMON CHECKLIST ITEMS (1-14)	P/R	YES	NO	NOTES
k. The first 65 feet of ballast from the back of the bunker (to support the metal tie sections) is to be installed by the construction contractor.	R			
12. SAT Emplacements:				
a. A No. 6 AWG bare copper conductor is provided between the grounding rod and the CJB mounting bolts.	R			
b. A 10 foot free length coil of No. 6 AWG copper wire is provided from the grounding rod.	R			
c. Target emplacements are IAW CEHNC 1110-1-23 (includes blockout for cables).	R			
13. SIT Emplacement:				
a. A No 6 AWG bare copper conductor is provided between the grounding rod and the CJB mounting bolt.	R			
b. A 9 foot free length coil of No. 6 AWG is provided from the grounding rod.	R			
c. Hostile fire simulator emplacements (if any) are within 20 feet on the side of stationary infantry target emplacements.	R			
d. Target emplacements are designed and constructed to provide positive drainage.	R			

COMMON CHECKLIST ITEMS (1-14)	P/R	YES	NO	NOTES
e. A minimum of 35 inches of clearance is provided from the rear of the emplacement to any retaining timber or rising ground to allow sufficient space for the target in the down position.	R			
f. Berm fill is level with the top of the protective timber at the front of the emplacement.	R			
g. Target emplacements are IAW CEHNC series manual (includes blackout for cables).	R			
14. MIT Emplacement:				
a. MIT track beds are placed at a 45 degree (+ 5 degrees) angle to the firing position(s).	R			
b. CJBs are positioned at the end of MIT nearest the firing line/firing position.	R			
c. A No. 6 AWG bare copper conductor is provided between the grounding rod and the CJB.	R			

COMMON CHECKLIST ITEMS (1-14)	P/R	YES	NO	NOTES
d. A 6 foot length coil of NO. 6 AWG bare conductor is provided from the grounding rod.	R			
e. Mounting support locations for elevated targets (if used) are IAW CEHNC 1110-1-23.	R			
f. Target emplacements are IAW CEHNC 1110-1-23 (includes blackout for cables).	R			

BALLAST CALCULATION

EXAMPLE: The standard MAT emplacement track is built on a subgrade that has a slope of 1/8 inch per foot. With a minimum of 5 inches of ballast under a 6 inch tie there is 0.454 cubic yards (CY) of ballast per linear foot (LF) of track length, For a standard MAT emplacement with a track length of 1150, 535 CY of ballast (0.465 CY/LF X 1150LF=535 CY) is calculated and with 10% extra for construction losses, 588 CY would be required (535% + 10%(535CY) = 588 CY). For MAT emplacements where the track length varies from standard 1150 feet, substitute the actual length in the place of the 1150 LF to calculate the CY needed.

NOTE: To convert cubic yards (CY) to tons use the laboratory density test result for the ballast being supplied.

PART IV  
CONSTRUCTION/TARGET  
INTERFACE CHECKLIST

ADMINISTRATIVE DATA RANGE INFORMATION	
1. TYPE RANGE: _____	
2. PN: _____	
3. INSTALLATION: _____	
4. MACOM: _____	
5. CONSTRUCTION COMPLETION DATE (EST) _____ (MONTH/YEAR)	
REVIEWER INFORMATION	
6. NAME: _____	
7. DATE: _____	
8. POSITION: _____	
9. ORGANIZATION: _____	
10. EVENT: _____ (Preconstruction Conference, CCI, TII)	
TARGETRY SHIPPING DATA (To be obtained during CCI or TII)	
11. Installation Transportation Office Shipping Address: _____ _____ _____ _____	
12. Unit ID Code (UIC): _____	
13. POC _____ POSITION _____	
14. PHONE # _____ DOAC _____	

HOW TO USE THIS CHECKLIST

1. This Range Modernization Construction Checklist is provided for use by personnel involved in the range modernization program effort. It is a checklist of common items which should be verified during construction phase of a range project. Use this checklist in conjunction with reference documents listed in Part V.
2. The checklist items are divided into categories by paragraph as follows:
- | Category (Area)                                     | Paragraph |
|---|-----------|
| RETS Emplacement Quantities .....                   | 1         |
| Training Considerations .....                       | 2         |
| Range Design.....                                   | 3         |
| Trails and Service Roads.....                       | 4         |
| Infantry Firing Positions .....                     | 5         |
| Control Tower .....                                 | 6         |
| Cable Junction Box .....                            | 7         |
| Data Breakout Box .....                             | 8         |
| Moving Armor Target (MAT) Emplacements .....        | 9         |
| Stationary Armor Target (SAT) Emplacements.....     | 10        |
| Stationary Infantry Target (SIT) Emplacements ..... | 11        |
| Moving Infantry Targets (MIT) Emplacements .....    | 12        |
3. Each checklist item is marked preferred (**P**) or required (**R**) on the checklist. The checklist user should mark the “**YES**” or “**NO**” block after each item and write clarifying remarks in the “**NOTES**” column when appropriate. Required items marked “**NO**” must be corrected or resolved prior to project continuation to the next phase.
4. Proposed users of the Construction checklist are identified but not limited to those shown below:
- | Purpose:                | Users:  |
|-------------------------|---|
| Construction Compliance | COE and Subcontractors/Inspection Contractors |
| Construction Compliance | RTSD Personnel                                |
| Construction Compliance | AMCCOM  |
| Target Interface        | COE and Subcontractors/Inspection Contractors |
| Target Interface        | RTSD Personnel                                |
| Target Interface        | AMCCOM and Subcontractor                      |
| Target Interface        | NGB   |
5. Appendices B through N in Part V outline the type/quantities of RETS hardware equipment associated with each standard RETS range. Each Range Standard Equipment List (RSEL), by type

range, has spaces provided for the checklist user to indicate the actual quantity of RETS equipment to be installed on the range project next to the normal quantity requirements. The completed project RSEL provides a verification of target quantities to project managers at various agencies throughout the planning, design, and construction phases of the project.

6. The checklist is designed to be a quality assurance guide only and is not intended to replace Army publications (ARs, TCs, FMs CEHNC 1110-1-23) which address key aspects of the range modernization program (see Part V). RTSD personnel will use this checklist in conjunction with the construction phase of assigned range projects. A copy will be used and attached to the formal MFR Target Interface Inspection Deficiencies List which results from all interface inspections. Designated post/installation personnel are encouraged to use it throughout the developmental cycle of each approved range project.

7. RTSD schedules the Construction Compliance Inspection (CCI) and the Target Interface Inspection (TII) during the construction phase of a RETS range project. Guidance for determining when these inspections should be scheduled is as follows:

a. CCI: The purpose of the CCI is to assess construction progress and to identify problem areas early to avoid costly and extensive corrective actions and project delays at the TII. RTSD will schedule the CCI in conjunction with the installation, MACOM, and Huntsville Center, COE when construction has reached the point that the following items can be checked (usually about midpoint of construction). For multipurpose/tank/Bradley ranges, a minimum of one of each type of target emplacement shall be complete, including the installation of the Cable Junction Boxes (CJB) and one power center with data breakout box. For small arms ranges one of each type of target position should be complete. In all cases the tower junction box and samples of the power and data cables and associated connectors shall be on site and available for inspection, but they do not have to be installed.

b. TII: The range is ready for the TII when all RETS targetry interface points are ready inspection (usually around 90-95 percent construction completion or about 30 days prior to the end of construction).

8. Targetry installation. A range is ready for RETS targetry installation when all deficiencies noted during the TII have been corrected and RTSD has been notified. The RETS installation contractor must have unrestricted access to the range during installation

.COMMON CHECKLIST ITEMS (1-12)	P/R	YES	NO	NOTES
1. RETS emplacement quantities are IAW CEHNC 1110-1-23 and TC 25-8 Any deviation require RTSD approval:	R			
2. Training Considerations:				
a. Its are oriented to face the firing line when upright.	R			
3. Range Design:				
a. Target emplacements meet DD 1391 and are IAW CEHNC 1110-1-23 requirements.	P			
b. Number of lanes meet DD 1391 and are IAW CEHNC 1110-1-23 requirements.	R			
c. Vegetation that does not obscure target positions is retained.	P			
d. Overall size and heights of front and side walls of target emplacement are IAW CEHNC 1110-1-23.	R			
e. Front walls meet the following heights:				
1) SIT = 16 inches. (minimum)	R			
2) MIT = 26 inches. (minimum)	R			
3) SAT = 53 inches.	R			

P = Preferred; R = Required

.COMMON CHECKLIST ITEMS (1-12)	P/R	YES	NO	NOTES
4) MAT (non-aerial gunnery) = 60 inches above sub-base.	R			
5) MAT (aerial gunnery) = 72 inches above sub--base.	R			
4. Trails and Service Roads: (CEHNC 1110-1-23)				
a. There are a minimum of two tank trails per lane. (armor)	R			
b. Tank trails and/or service road networks provide access to target emplacements for maintenance.	P			
5. Infantry Firing Positions (CEHNC 1110-1-23):				
a. Foxholes are provided within each lane at the firing line on small arms ranges.	R			
b. Foxholes are provided at firing positions on collective training ranges.	P			
c. Additional firing positions are provided along firing line for supporting shooters. (sniper)	R			
d. Foxholes provide clear visibility of targets and facilitate drainage.	R			
e. Designated targets and target arrays are visible from downrange infantry firing positions.	R			

.COMMON CHECKLIST ITEMS (1-12)	P/R	YES	NO	NOTES
f. Downrange firing positions are sited to take advantage of natural terrain and vegetation concealment.	P			
f. Provisions are made for drainage of firing positions.	R			
6. Control Tower (CEHNC 1110-1-23):				
a. Work table surface is 36 inches deep by the width of the tower minus a 36 inch space for a free standing printer and has a 2 inch X 12 inch slot for cable access.	R			
b. HVAC is provided.	R			
c. Back wall of control room is windowless.	P			
d. A single point ground (SPG) plate is installed	R			
e. Sufficient supports and space are provided for mounting signal distribution assembly (SDA) IAW CEHNC 1110-1-23.	R			
f. A No. 6 AWG insulated ground cable is installed between the SPG and the tower junction box (TJB).	R			
g. A No. 1/0 AWG insulated ground is installed between the SPG and SDA location. (Leave 4 feet of free length.)	R			

.COMMON CHECKLIST ITEMS (1-12)	P/R	YES	NO	NOTES
h. The tower ground is certified by COE contractor to yield earth resistance of 25 ohms or less.	R			
i. A 240 VAC, 1 phase, 2 pole, 20 amp circuit is provided in junction box located within 3 feet of the SDA mounting.	R			
j. A 2 inch conduit with pull wire is provided from the TJB to the SDA location IAW CEHNC 1110-1-23.	R			
k. A 4 inch X 4 inch wire way is provided between the SDA and the RCS computer location IAW CEHNC 1110-1-23.	R			
l. Data cables (type PE-39, 19 AWG, multiple twisted pair (armor) or 6 twisted pair (infantry)) are installed leading from downrange to the TJB with 6 feet of free length. Cables are tagged (adjacent to conduit penetrations) showing cable destinations.	R			
m. Data cables are free of splices.	R			
n. TJB size, configuration, threaded studs with collar, and spacing conform to requirements shown in CEHNC 1110-1-23. Collar shall be free of paint, rust and coated with an electrical conductive oxide inhibiting compound. Provide one nut for each stud.	R			
o. All conduit penetrations	R			

.COMMON CHECKLIST ITEMS (1-12)	P/R	YES	NO	NOTES
of TJB are waterproof.				
p. Pull wires are provided in all empty conduits.	R			
q. Lightning protection meets national Fire Prevention Association (NFPA) code 78.	R			
r. Direct burial of data and power cables meet minimum separation requirements, i.e., low voltage = 8 inches; high voltage = 24 inches.	R			
7. Cable Junction Boxes (CJB)				
a. All CJB are NEMA-4 boxes IAW CEHNC 1110-1-23.	R			
b. CJB is installed in target emplacement.	R			
c. Data and power cables are installed in CJB (one per opening) with 16 inches of free length inside the box.	R			
d. Permanent tags are attached to the cables (inside the box, directly above the conduit opening) to identify the cable destination.	R			
e. A set of as-built drawings identifying the cable runs is available for the equipment installer.	R			
f. Watertight fittings are provided for all conduit and cable entries.	R			

.COMMON CHECKLIST ITEMS (1-12)	P/R	YES	NO	NOTES
g. CJB dimensions, configuration, and standoff location and spacing are IAW CEHNC 1110-1-23 CJB drawing.	R			
h. Power cable size does not exceed No. 2 AWG-copper, 3 wire with ground and is shielded.	R			
i. CJB cover holding screws do not penetrate the box.	R			
j. Tops of standoff are free of paint and rust and are coated with an electrical conductive oxide inhibiting compound. Provide four 1/2-inch-long screws for the standoffs.	R			
k. All pre-punched holes provided for equipment installer are correct size, properly spaced and sealed with temporary seals.	R			
8. Data Breakout Boxes (DBB): (Armor Ranges Only)				
a. All DBB are NEMA-4 boxes IAW CEHNC 1110-1-23.	R			
b. DBB dimensions, configuration, and threaded studs with collar, spacing IAW CEHNC 1110-1-23. Collar shall be free of paint, rust and coated with an electrical conductive oxide inhibiting compound. Nuts are provided for the studs.	R			

.COMMON CHECKLIST ITEMS (1-12)	P/R	YES	NO	NOTES
c. Data cables (one per conduit) are installed in DBB with 6 feet of free length coiled inside box.	R			
d. Permanent tags are attached to the cables (inside the box, directly above the conduit entry) identifying cable destination.	R			
e. Multiple twisted wire pair PE-39 cable is routed between the TJB and the DBB and between all other DBBs.	R			
f. Six twisted pair PE-39 cable is routed between the DBB and CJBs.	R			
g. A No. 6 AWG bare copper conductor is provided between the DBB and the grounding rod. (other than MAT emplacements)	R			
h. A 20 amp, 240 volt circuit is provided to the BDD to power a modem. Excess conductor (6 feet) is coiled in the DBB.	R			
9. MAT Emplacements:				
a. A 10 foot free length coil of No. 4/) AWG bare copper conductor is provided from the bunker ground field to the vicinity of the CJB.	R			
b. A spare single-pole, 120 volt, 20 amp circuit breaker is provided in power panel for the motor starter control circuit.	R			

.COMMON CHECKLIST ITEMS (1-12)	P/R	YES	NO	NOTES
c. A 25-30 KVA, 480VAC, 3-phase isolation transformer for bus bar heater power is provided.	R			
d. The MAT carrier power is supplied from a 480 VAC, 75 KVA, (minimum), 3-phase transformer.	R			
e. Track bed width is a minimum of 144 inches.	R			
f. MAT track grade does not exceed 5.7 degrees (10 percent).	R			
g. The first 60 meters (196 feet) of MAT roadbed (at its power source end) and the last 40 meters (131 feet) of track has a grade of 0 degrees ±1 percent.	R			
h. The minimum turning radius of curved track is 152.4 meter (500 feet).	R			
i. Conduit (with pull wires) and sufficient space is available for equipment installation IAW CEHNC 1110-1-23.	R			
j. 588 CY of No. 57 ballast shall be stock piled for each MAT track installation. Ballast shall be laboratory tested to determine its maximum compacted density. See page E-22 for information on MAT ballast calculations.	R			
k. The first 65 feet of ballast from the back of the bunker (to support the metal tie sections) is installed by the construction contractor.	R			

.COMMON CHECKLIST ITEMS (1-12)	P/R	YES	NO	NOTES
10. SAT Emplacements:				
a. A No. 6 AWG bare copper conductor is provided between the grounding rod and the CJB mounting bolt.	R			
b. A 10 foot free length coil of No. 6 AWG copper wire is provided from the grounding rod.	R			
11. SIT Emplacements:				
a. A No. 6 AWG bare copper conductor is provided between the grounding rod and the CJB mounting bolt.	R			
b. A 9-foot free length coil of No. 6 AWG is provided from the grounding rod.	R			
c. Hostile fire simulator emplacements (if any) are within 20 feet on the side of stationary infantry target emplacements.	R			
d. Target emplacements are sloped to the rear of the emplacements for drainage.	R			
e. A minimum of 35 inches of clearance is provided from the rear of the emplacement to any retaining timber or rising ground to allow sufficient space for the target in the down position.	R			
f. Berm fill is level with the top of the protective timber at the front of the emplacement.	R			

.COMMON CHECKLIST ITEMS (1-12)	P/R	YES	NO	NOTES
12. MIT Emplacement:				
a. IMTC track beds are placed at a 45 degree (+ 5 degrees) angle to the firing position(s)	R			
b. CJBs are positioned at the end of IMTC nearest the firing line/firing position.	R			
c. A No. 6 AWG bare copper conductor is provided between the grounding rod and the CJB.	R			
d. A 6 foot length coil of No. 6 AWG bare conductor is provided from the grounding rod.	R			
e. Mounting supports locations for elevated targets (if used) are IAW CEHNC 1110-1-23.	R			

BALLAST CALCULATION

EXAMPLE: The standard MAT emplacement track is built on a subgrade that has a slope of 1/8 inch per foot. With a minimum of 5 inches of ballast under a 6 inch tie there is 0.465 cubic yards (CY) of ballast per linear foot (LF) of track length, For a standard MAT emplacement with a track length of 1150, 535 CY of ballast (0.465 CY/LF X 1150 LF = 535 CY) is calculated and with 10% extra for construction losses, 588 CY would be required (535 + 10% (535CY) = 588CY). For MAT emplacements where the track length varies from the standard 1150 feet, substitute the actual length in the place of the 1150 LF to calculate the CY needed.

NOTE: To convert cubic yards (CY to tons use the laboratory density test result for the ballast being supplied.

PART V REFERENCES		
AR 40-5, Health and Environment	DA PAM 350-39, Standards in Weapons Training (Special Operations Forces)	FM 23-85, 60-MM Mortar, M19
AR 200-1, Environmental Protection and Enhancement	DD Form 1391, Military Construction Project Data	FM 23-90, 81-MM Mortar
AR 200-2, Environmental Effects of Army Actions	FM 5-25, Explosives and Demolitions	FM 23-91, Mortar Gunnery
AR 210-20, Master Planning for Army Installations	FM 6-40, Field Artillery Cannon Gunnery	FM 23-92, 4.2-Inch Mortar, M30
AR 210-21, Army Training Ranges and Land	FM-7-11B1, Soldier’s Manual: MOS 11B1, Infantryman (Skill Level 1)	FM 25-1, Training
AR 385-10, Army Safety Program	FM-7-11B2, Soldier’s Manual: MOS 11B, Infantryman (Skill Level 2)	FM 44-1-2, Air Defense Artillery Reference Handbook
AR 385-30, Safety Color Code Marking and Signs	FM 9-15, Explosive Ordnance Disposal Service and Unit Operations	FM 44-4, Operations and Training, Chaparral
AR 385-62, Regulations for Firing Guided Missiles and Heavy Rockets for Training, Target Practice and Combat	FM 17-12-1, Tank Combat Tables—M1	FM 44-5, Operations and Training, Vulcan
AR 385-63, Policies and Procedures for Firing Ammunition for Training, Target Practice and Combat	FM 17-12-2, Tank Gunnery for M60, M60A1, (AOS), and M48A Tanks	FM 44-62, Air Defense Artillery Automatic Weapon Gunnery
AR 385-64, Ammunition and Explosives Safety Standards	FM 17-12-3, Tank Combat Tables—M60A3	FM 44-102, Procedures for Ballistic Aerial Target System
AR 385-65, Identification of Inert Ammunition and Ammunition Components	FM 17-12-7, Tank Gunnery Devices	FM 90-10 (HTF), Military Operations on Urbanized Terrain (MOUT)(How to Fight)
AR 415-15, Military Construction, Army (MCA) Program Development	FM 17-40, Helicopter Gunnery	FM 90-10-1, An Infantryman’s Guide to Urban Combat (HTF) (How to Fight)
AR 415-20, Project Development and Design Approval	FM 21-2, Soldier’s Manual of Common Tasks (Skill Level 1)	NGR 415-5, Standard Operating Procedures for Military Construction Army National Guard Programs (MCARNG) Major and Minor Projects
AR 415-28, Department of the Army Facility Classes and Construction Categories (Category Codes)	FM 23-1, Bradley Fighting Vehicle Gunnery	TC 23-14, Sniper Training and Employment
AR 415-35, Minor Construction	FM 23-9, M16A1 Rifle and Rifle Marksmanship	TC 23-23, TOW Heavy Antitank Weapon System
AR 420-74, Natural Resources: Land, Forest, and Wildlife Management	FM 23-11 90-mm Recoilless Rifle, M67	TC 23-24, Dragon Medium Antitank/Assault Weapon System M47
AR 420-40, Historic Preservation	FM 23-14, Squad Automatic Weapon (SAW), M249	TC 25-1, Training Land
ARTEP 7-15, Infantry Battalions (Infantry, Airborne, Air, Assault and Ranger)	FM 23-30, Grenades and Pyrotechnic Signals	TC 25-3, Training Ammunition (Training Ammunition Guidelines)
ARTEP 71-2, Mechanized Infantry/Tank Task Force	FM 23-31, 40-MM Grenade Launchers M203 and M79	TC 25-8, Training Ranges
CEHNC 1110-1-23, Design Manual For Remoted Target Systems (RETS) Ranges	FM 23-33, 66MM HEAT Rocket, M72A1, M72A2 (Light Antitank Weapon)	TC 90-1, Military Operations on Urbanized Terrain Training
DA PAM 350-38, Standards in Weapons Training	FM 23-35, Pistols and Revolvers	TD MED 501, Occupational and Environmental Health:Hearing Conservation
	FM 23-41, Submachine guns, Caliber .45, M3, and M3A1	
	FM 23-65, Browning Machinegun, Caliber .5HB, M2	
	FM 23-67, Machine gun 7.62-MM, M60	

PART VI  
STANDARD EQUIPMENT LISTS (SEL’S)

1. Automated Record Fire (ARF). The “standard” targetry and ancillary equipment quantities shown are recommended, actual quantities must be based on training requirements and site adapted design.

a. Number of Lanes: Standard: 16 Actual:\_\_\_\_\_

b. RETS Equipment:	Standard:	Actual
ITM	<u>112</u>	_____
IMTC	<u>-</u>	_____
THMTG	<u>-</u>	_____
AMTC	<u>-</u>	_____
JBL	<u>112</u>	_____
JBH	<u>-</u>	_____
TIU	<u>-</u>	_____
DBB	<u>-</u>	_____
DTA	<u>-</u>	_____
IHFS	<u>32</u>	_____
NMFS	<u>32</u>	_____
ATKS	<u>-</u>	_____
RCS	<u>1</u>	_____

c. RETS Emplacement Locations (TC 25-8; CEHNC 1110-1-23):

- (1) SIT: 7 per lane
- (a) 50 meters (2 ITMs)
- (b) 100 meters
- (c) 150 meters
- (d) 200 meters
- (e) 250 meters
- (f) 300 meters
- (2) MIT: NA per lane
- (a) - meters
- (3) MAT: NA per (lane) (range)
- (a) - meters
- (4) SAT: NA per (lane) (range)
- (a) - meters

2. Automated Field Fire (AFF). The “standard” targetry and ancillary equipment quantities shown are recommended. Actual quantities must be based on training requirements and site adapted design.

a. Number of Lanes: Standard: 32 Actual:\_\_\_\_\_

b. RETS Equipment:	Standard:	Actual
ITM	<u>96</u>	_____
IMTC	<u>-</u>	_____
THMTG	<u>-</u>	_____
AMTC	<u>-</u>	_____
JBL	<u>96</u>	_____
JBH	<u>-</u>	_____
TIU	<u>-</u>	_____
DBB	<u>-</u>	_____
DTA	<u>-</u>	_____
IHFS	<u>-</u>	_____
NMFS	<u>-</u>	_____
ATKS	<u>-</u>	_____
RCS	<u>1</u>	_____

c. RETS EMPLACEMENT LOCATIONS (TC 25-8; CEHNC 1110-1-23):

- (1) SIT: 3 per lane
- (a) 75 meters (2 ITMs)
- (b) 175 meters
- (c) 300 meters
- (2) MIT: NA per lane
- (a) - meters
- (3) MAT: NA per (lane) (range)
- (a) - meters
- (4) SAT: NA per (lane) (range)
- (a) - meters

3. Modified Record Fire (MRF). The “standard” targetry and ancillary equipment quantities shown are recommended. Actual quantities must be based on training requirements and site adapted design.

a. Number of Lanes:	Standard: <u>16</u>	Actual:_____
b. RETS Equipment:	Standard:	Actual:
ITM	<u>144</u>	_____
IMTC	<u>-</u>	_____
THMTG	<u>-</u>	_____
AMTC	<u>-</u>	_____
JBL	<u>144</u>	_____
JBH	<u>-</u>	_____
TIU	<u>-</u>	_____
DBB	<u>-</u>	_____
DTA	<u>-</u>	_____
IHFS	<u>32</u>	_____
NMFS	<u>32</u>	_____
ATKS	<u>-</u>	_____
RCS	<u>1</u>	_____

c. RETS Emplacement Locations (TC 25-8; CEHNC 1110-1-23):

- (1) SIT: 9 per lane
  - (a) 50 meters (2 ITMs)
  - (b) 75 meters
  - (c) 100 meters
  - (d) 150 meters
  - (e) 175 meters
  - (f) 200 meters
  - (g) 250 meters
  - (h) 300 meters
- (2) MIT: NA per lane
  - (a) - meters
- (3) MAT: NA per (lane) (range)
  - (a) - meters
- (4) SAT: NA per (lane) (range)
  - (a) - meters

4. Combat Pistol Qualification Course (CPQC): The “standard” targetry and ancillary equipment quantities shown are recommended. Actual quantities must be based on training requirements and site adapted design.

a. Number of Lanes:	Standard: <u>15</u>	Actual:_____
b. RETS Equipment:	Standard:	Actual:
ITM	<u>105</u>	_____
IMTC	<u>-</u>	_____
THMTG	<u>-</u>	_____
AMTC	<u>-</u>	_____
JBL	<u>105</u>	_____
JBH	<u>-</u>	_____
TIU	<u>-</u>	_____
DBB	<u>-</u>	_____
DTA	<u>-</u>	_____
IHFS	<u>-</u>	_____
NMFS	_____	_____
ATKS	<u>-</u>	_____
RCS	<u>1</u>	_____

c. RETS Emplacement Locations (TC 25-8; CEHNC 1110-1-23):

- (1) SIT: 7 per lane
  - (a) 10 meters (2 ITMs)
  - (b) 13 meters
  - (c) 16 meters
  - (d) 17 meters
  - (d) 23 meters
  - (e) 27 meters
  - (f) 31 meters
- (2) MIT: NA per lane
  - (1) - meters
- (3) MAT: NA per (lane) (range)
  - (1) - meters
- (4) SAT: NA per (lane) (range)
  - (a) - meters

5. Sniper Field Fire (SFF). The “standard” targetry and ancillary equipment quantities shown are recommended. Actual quantities must be based on training requirements and site adapted design.

a. Number of Lanes:	Standard: <u>  4  </u>	Actual:_____
b. RETS Equipment:	Standard:	Actual:
ITM	<u>  48*  </u>	_____
IMTC	_____	_____
THMTG	<u>  -  </u>	_____
AMTC	<u>  -  </u>	_____
JBL	<u>  36  </u>	_____
JBH	<u>  8  </u>	_____
TIU	<u>  -  </u>	_____
DBB	<u>  -  </u>	_____
DTA	<u>  -  </u>	_____
IHFS	<u>  -  </u>	_____
NMFS	<u>  -  </u>	_____
ATKS	<u>  -  </u>	_____
RCS	<u>  1  </u>	_____

c. RETS Emplacement Locations (CEHNC 1110-1-23):

- (1) SIT:   12   per lane
- (a)   100   meters

(b)   175   meters

(b)   300   meters

(c)   400   meters

(d)   475   meters

(e)   600   meters

(f)   700   meters

(g)   800   meters

(h)   900   meters

(h)  1000   meters
- (2) MIT:   5   per lane
- (a)   250   meters

(b)   500   meters
- (3) MAT:   NA   per (lane) (range)
- (1)   -   meters
- (4) SAT:   NA   per (lane) (range)
- (1)   -   meters

6. Multipurpose Machine Gun (MPMG) Range —SAW/M60/M2. The “standard” targetry and ancillary equipment quantities shown are recommended. Actual quantities must be based on training requirements and site adapted design.

a. Number of Lanes:	Standard: <u>  10  </u>	Actual:_____
b. RETS Equipment:	Standard:	Actual:
ITM	<u>  150  </u>	_____
IMTC	<u>  -  </u>	_____
THMTG	<u>  -  </u>	_____
AMTC	<u>  -  </u>	_____
JBL	<u>  150  </u>	_____
JBH	<u>  -  </u>	_____
TIU	<u>  -  </u>	_____
DBB	<u>  -  </u>	_____
DTA	<u>  120  </u>	_____
IHFS	<u>  -  </u>	_____
NMFS	<u>  -  </u>	_____
ATKS	<u>  -  </u>	_____
RCS	<u>  1  </u>	_____

c. RETS Emplacement Locations (CEHNC 1110-1-23):

- (1) SIT:   15   per lane
- (a)   100   meters

(b)   200   meters

(c)   300   meters

(d)   400   meters (DTA)

(e)   450   meters (DTA)

(f)   500   meters (DTA)

(g)   550   meters (DTA)

(h)   600   meters (DTA)

(i)   650   meters (DTA)

(j)   700   meters (DTA)

(k)   800   meters (4 ITM’s w/DTA)

(l)  1000   meters (DTA)
- (2) MIT:   NA   per lane
- (a)   -   meters
- (3) MAT:   NA   per (lane) (range)
- (a)   -   meters
- (4) SAT:   NA   per (lane) (range)
- (a)   -   meters

7. Multipurpose Machine Gun (MPMG) Range—SAW. The “standard” targetry and ancillary equipment quantities shown are recommended. Actual quantities must be based on training requirements and site adapted design.

a. Number of Lanes:	Standard: <u>10</u>	Actual:
b. RETS Equipment:	Standard:	Actual
ITM	<u>90</u>	_____
IMTC	<u>-</u>	_____
THMTG	<u>-</u>	_____
AMTC	<u>-</u>	_____
JBL	<u>90</u>	_____
JBH	<u>-</u>	_____
TIU	<u>-</u>	_____
DBB	<u>-</u>	_____
DTA	<u>60</u>	_____
IHFS	<u>-</u>	_____
NMFS	<u>-</u>	_____
ATKS	<u>-</u>	_____
RCS	<u>1</u>	_____

c. RETS EMPLACEMENT LOCATIONS (CEHNC 1110-1-23):

- (1) SIT: 9 per lane
- (a) 100 meters
- (a) 200 meters
- (c) 300 meters
- (d) 400 meters (DTA)
- (e) 600 meters (DTA)
- (f) 800 meters (4 ITMs - DTA)
- (2) MIT: NA per lane
- (a) - meters
- (3) MAT: NA per (lane) (range)
- (a) - meters
- (4) SAT: NA per (lane) (range)
- (a) - meters

8. Multipurpose Machine Gun (MPMG) Range—(M60). The “standard” targetry and ancillary equipment quantities shown are recommended. Actual quantities must be based on training requirements and site adapted design.

a. Number of Lanes:	Standard: <u>10</u>	Actual: _____
b. RETS Equipment:	Standard:	Actual:
ITM	<u>80</u>	_____
IMTC	<u>-</u>	_____
THMTG	<u>-</u>	_____
AMTC	<u>-</u>	_____
JBL	<u>80</u>	_____
JBH	<u>-</u>	_____
TIU	<u>-</u>	_____
DBB	<u>-</u>	_____
DTA	<u>80</u>	_____
IHFS	<u>-</u>	_____
NMFS	<u>-</u>	_____
ATKS	<u>-</u>	_____
RCS	<u>1</u>	_____

c. RETS Emplacement Locations (CEHNC 1110-1-23):

- (1) SIT: 8 per lane
- (a) 400 meters (DTA)
- (b) 450 meters (DTA)
- (c) 500 meters (DTA)
- (d) 550 meters (DTA)
- (e) 600 meters (DTA)
- (f) 650 meters (DTA)
- (g) 700 meters (DTA)
- (h) 800 meters (DTA)
- (2) MIT: NA per lane
- (a) - meters
- (3) MAT: NA per (lane) (range)
- (a) - meters
- (4) SAT: NA per (lane) (range)
- (a) - meters

9. Multipurpose Machine Gun (MPMG) Range—M2. The “standard” targetry and ancillary equipment quantities shown are recommended. Actual quantities must be based on training requirements and site adapted design.

a. Number of Lanes:	Standard: <u>10</u>	Actual:_____
b. RETS Equipment:	Standard:	Actual:
ITM	<u>50</u>	_____
IMTC	<u>-</u>	_____
THMTG	<u>-</u>	_____
AMTC	<u>-</u>	_____
JBL	<u>50</u>	_____
JBH	<u>-</u>	_____
TIU	<u>-</u>	_____
DBB	<u>-</u>	_____
DTA	<u>50</u>	_____
IHFS	<u>-</u>	_____
NMFS	_____	_____
ATKS	<u>-</u>	_____
RCS	<u>1</u>	_____

d. RETS Emplacement Locations (CEHNC 1110-1-23):

- (1) SIT: 5 per lane
- (a) 400 meters (DTA)

(b) 500 meters (DTA)

(c) 600 meters (DTA)

(d) 800 meters (DTA)

(e) 1000 meters (DTA)
- (2) MIT: NA per lane
- (a) - meters
- (3) MAT: NA per (lane) (range)
- (a) - meters
- (4) SAT: NA per (lane) (range)
- (a) - meters

10. Multipurpose Machine Gun (MPMG) Range—SAW/M60. The “standard” targetry and ancillary equipment quantities shown are recommended. Actual quantities must be based on training requirements and site adapted design.

a. Number of Lanes:	Standard: <u>10</u>	Actual:_____
b. RETS Equipment:	Standard:	Actual:
ITM	<u>140</u>	_____
IMTC	<u>-</u>	_____
THMTG	<u>-</u>	_____
AMTC	<u>-</u>	_____
JBL	<u>140</u>	_____
JBH	<u>-</u>	_____
TIU	<u>-</u>	_____
DBB	<u>-</u>	_____
DTA	<u>110</u>	_____
IHFS	<u>-</u>	_____
NMFS	<u>-</u>	_____
ATKS	<u>-</u>	_____
RCS	<u>1</u>	_____

c. RETS Emplacement Locations (CEHNC 1110-1-23):

- (1) SIT: 14 per lane
- (a) 100 meters

(b) 200 meters

(c) 300 meters

(d) 400 meters (w/DTA)

(e) 450 meters (w/DTA)

(f) 500 meters (w/DTA)

(g) 550 meters (w/DTA)

(h) 600 meters (w/DTA)

(i) 650 meters (w/DTA)

(j) 700 meters (w/DTA)

(k) 800 meters (4 ITM’s w/DTA)
- (2) MIT: NA per lane
- (1) - meters
- (3) MAT: NA per (lane) (range)
- (a) - meters
- (4) SAT: NA per (lane) (range)
- (a) - meters

11. Multipurpose Machine Gun (MPMG) Range—SAW/M2. The “standard” targetry and ancillary equipment quantities shown are recommended. Actual quantities must be based on training requirements and site adapted design.

a. Number of Lanes:	Standard: <u>10</u>	Actual: _____
b. RETS Equipment:	Standard:	Actual:
ITM	<u>110</u>	_____
IMTC	<u>-</u>	_____
THMTG	<u>-</u>	_____
AMTC	<u>-</u>	_____
JBL	<u>110</u>	_____
JBH	<u>-</u>	_____
TIU	<u>-</u>	_____
DBB	<u>-</u>	_____
DTA	<u>80</u>	_____
IHFS	<u>-</u>	_____
NMFS	<u>-</u>	_____
ATKS	<u>-</u>	_____
RCS	<u>1</u>	_____

c.. RETS Emplacement Locations (CEHNC 1110-1-23):

- (1) SIT: 11 per lane
  - (a) 100 meters
  - (b) 200 meters
  - (c) 300 meters
  - (d) 400 meters (DTA)
  - (e) 500 meters (DTA)
  - (f) 600 meters (DTA)
  - (g) 800 meters (4 ITMs - DTA)
  - (h) 1000 meters (DTA)
- (2) MIT: NA per lane
  - (a) - meters
- (3) MAT: NA per (lane) (range)
  - (a) - meters
- (4) SAT: NA per (lane) (range)
  - (a) - meters

12. Multipurpose Machine Gun (MPMG) Range—M60/M2. The “standard” targetry and ancillary equipment quantities shown are recommended. Actual quantities must be based on training requirements and site adapted design.

a. Number of Lanes:	Standard: <u>10</u>	Actual: _____
b. RETS Equipment:	Standard:	Actual:
ITM	<u>90</u>	_____
IMTC	<u>-</u>	_____
THMTG	<u>-</u>	_____
AMTC	<u>-</u>	_____
JBL	<u>90</u>	_____
JBH	<u>-</u>	_____
TIU	<u>-</u>	_____
DBB	<u>-</u>	_____
DTA	<u>90</u>	_____
IHFS	<u>-</u>	_____
NMFS	_____	_____
ATKS	<u>-</u>	_____
RCS	<u>1</u>	_____

c RETS Emplacement Locations (CEHNC 1110-1-23):

- (1) SIT: 9 per lane
  - (a) 400 meters (DTA)
  - (b) 450 meters (DTA)
  - (c) 500 meters (DTA)
  - (d) 550 meters (DTA)
  - (e) 600 meters (DTA)
  - (f) 650 meters (DTA)
  - (g) 700 meters (DTA)
  - (h) 800 meters (DTA)
  - (i) 1000 meters (DTA)
- (2) MIT: NA per lane
  - (a) - meters
- (3) MAT: NA per (lane) (range)
  - (a) - meters
- (4) SAT: NA per (lane) (range)
  - (a) - meters

13. Multipurpose Range Complex—Light (MPRC—LI). The “standard” targetry and ancillary equipment quantities shown are recommended. Actual quantities must be based on training requirements and site adapted design.

a. Number of Lanes: Standard:   1   Actual:\_\_\_\_\_

b. RETS Equipment:	Standard:	Actual:
ITM	<u>199*</u>	_____
IMTC	<u>46</u>	_____
THMTG	<u>37</u>	_____
AMTC	<u>9</u>	_____
JBL	<u>199</u>	_____
JBH	<u>46</u>	_____
TIU	<u>46</u>	_____
DBB	<u>-</u>	_____
DTA	<u>18</u>	_____
IHFS	<u>45</u>	_____
NMFS	<u>140</u>	_____
ATKS	<u>46</u>	_____
RCS	<u>1</u>	_____

c. RETS Emplacement Locations (TC 25-8; CEHNC 1110-1-23):

- (1) SIT: 153 per lane
- (a) - meters

(b) - meters

(c) - meters
- (2) MIT: 46 per lane
- (a) - meters
- (3) MAT: 9 per (lane) (range)
- (a) - meters
- (4) SAT: 37 per (lane) (range)
- (a) - meters
- (5) Target Arrays (type/quantity) and range band distance (meters) IAW FM 17-12-1, 2, 3 and FM 23-1.

*\*ITM’s = Stationary Infantry Target Emplacements plus Moving Infantry Target Emplacements.*

14. Multipurpose Range Complex—Heavy (MPRC-H). The “standard” targetry and ancillary equipment quantities shown are recommended. Actual quantities must be based on training requirements and site adapted design.

a. Number of Lanes: Standard:   3   Actual:\_\_\_\_\_

b. RETS Equipment:	Standard:	Actual:
ITM	<u>198*</u>	_____
IMTC	<u>45</u>	_____
THMTG	<u>60</u>	_____
AMTC	<u>12</u>	_____
JBL	<u>225</u>	_____
JBH	<u>45</u>	_____
TIU	<u>72</u>	_____
DBB	<u>-</u>	_____
DTA	<u>18</u>	_____
IHFS	<u>-</u>	_____
NMFS	<u>140</u>	_____
ATKS	<u>72</u>	_____
RCS	<u>1</u>	_____

c. RETS Emplacement Locations (TC 25-8; CEHNC 1110-1-23):

- (1) SIT: 51 per lane
- (a) - meters

(b) - meters

(c) - meters
- (2) MIT: 15 per lane
- (a) - meters
- (3) MAT: 4 per (lane) (range)
- (a) - meters
- (4) SAT: 20 per (lane) (range)
- (a) - meters
- (5) Target Arrays (type/quantity) and range band distance (meters) IAW FM 17-12-1, 2, 3 and FM 23-1.

*\*ITM’s = Stationary Infantry Target Emplacements plus Moving Infantry Target Emplacements.*

15. Multipurpose Training Range (MPTR)—Tank/BFV. The “standard” targetry and ancillary equipment quantities shown are recommended. Actual quantities must be based on training requirements and site adapted design.

a. Number of Lanes:	Standard: <u>  1  </u>	Actual: <u>          </u>
b. RETS Equipment:	Standard:	Actual:
ITM	<u>  50  </u>	<u>          </u>
IMTC	<u>  -  </u>	<u>          </u>
THMTG	<u>  20  </u>	<u>          </u>
AMTC	<u>  4  </u>	<u>          </u>
JBL	<u>  74  </u>	<u>          </u>
JBH	<u>  -  </u>	<u>          </u>
TIU	<u>  24  </u>	<u>          </u>
DBB	<u>  5  </u>	<u>          </u>
DTA	<u>  12  </u>	<u>          </u>
IHFS	<u>  50  </u>	<u>          </u>
NMFS	<u>  25  </u>	<u>          </u>
ATKS	<u>  24  </u>	<u>          </u>
RCS	<u>  1  </u>	<u>          </u>

- c. RETS Emplacement Locations (TC 25-8; CEHNC 1110-1-23):
- (1) SIT:   50   per lane
- (a)   -   meters
- (b)   -   meters
- (c)   -   meters
- (2) MAT:   4   per lane
- (a)   -   meters
- (3) SAT:   20   per (lane) (range)
- (a)   -   meters
- (4) Target Arrays (type/quantity) and range band distance (meters) IAW FM 17-12-1, 2, 3 and FM 23-1.

16. Multipurpose Training Range (MPTR)—BFV. The “standard” targetry and ancillary equipment quantities shown are recommended. Actual quantities must be based on training requirements and site adapted design.

a. Number of Lanes:	Standard: <u>  1  </u>	Actual: <u>          </u>
b. RETS Equipment:	Standard:	Actual:
ITM	<u>  34  </u>	<u>          </u>
IMTC	<u>  -  </u>	<u>          </u>
THMTG	<u>  12  </u>	<u>          </u>
AMTC	<u>  2  </u>	<u>          </u>
JBL	<u>  48  </u>	<u>          </u>
JBH	<u>  -  </u>	<u>          </u>
TIU	<u>  14  </u>	<u>          </u>
DBB	<u>  3  </u>	<u>          </u>
DTA	<u>  8  </u>	<u>          </u>
IHFS	<u>  34  </u>	<u>          </u>
NMFS	<u>  17  </u>	<u>          </u>
ATKS	<u>  14  </u>	<u>          </u>
RCS	<u>  1  </u>	<u>          </u>

- c. RETS EMPLACEMENT LOCATIONS (TC 25-8; CEHNC 1110-1-23):
- (1) SIT:   34   per lane
- (a)   -   meters
- (b)   -   meters
- (c)   -   meters
- (2). MAT:   2   per lane
- (a)   -   meters
- (3) SAT:   12   per (lane) (range)
- (a)   -   meters
- (4) Target Arrays (type/quantity) and range band distance (meters) IAW FM 17-12-1, 2, 3 and FM 23-1.

17. Tank Gunnery Range (TGR). The “standard” targetry and ancillary equipment quantities shown are recommended. Actual quantities must be based on training requirements and site adapted design.

a. Number of Lanes: Standard: 1 Actual:\_\_\_\_\_

b. RETS Equipment:	Standard:	Actual:
ITM	<u>26</u>	_____
IMTC	<u>-</u>	_____
THMTG	<u>36</u>	_____
AMTC	<u>4</u>	_____
JBL	<u>66</u>	_____
JBH	<u>-</u>	_____
TIU	<u>40</u>	_____
DBB	<u>4</u>	_____
DTA	<u>6</u>	_____
IHFS	<u>-</u>	_____
NMFS	<u>-</u>	_____
ATKS	<u>40</u>	_____
RCS	<u>1</u>	_____

c. RETS Emplacement Locations (TC 25-8; CEHNC 1110-1-23):

- (1) SIT: 26 per lane
- (a) - meters

(b) - meters

(c) - meters
- (2) MAT: 4 per lane
- (a) - meters
- (3) SAT: 36 per (lane) (range)
- (a) - meters
- (4) Target Arrays (type/quantity) and range band distance (meters) IAW FM 17-12-1, 2, 3 and FM 23-1.

18. Antiarmor Tracking and Live Fire Range (AATLFR). The “standard” targetry and ancillary equipment quantities shown are recommended. Actual quantities must be based on training requirements and site adapted design.

a. Number of Lanes: Standard: 1 Actual:\_\_\_\_\_

b. RETS Equipment:	Standard:	Actual:
ITM	<u>-</u>	_____
IMTC	<u>-</u>	_____
THMTG	<u>4</u>	_____
AMTC	<u>2</u>	_____
JBL	<u>6</u>	_____
JBH	<u>-</u>	_____
TIU	<u>6</u>	_____
DBB	<u>-</u>	_____
DTA	<u>-</u>	_____
IHFS	<u>-</u>	_____
NMFS	<u>-</u>	_____
ATKS	<u>6</u>	_____
RCS	<u>1</u>	_____

c. RETS Emplacement Locations (TC 25-8; CEHNC 1110-1-23):

- (1) SIT: - per lane
- (a) - meters

(b) - meters

(c) - meters
- (2) MAT: - per lane
- (a) - meters
- (3) SAT: - per (lane) (range)
- (a) - meters
- (4) Target Arrays (type/quantity) and range band distance (meters) IAW FM 17-12-1, 2, 3 and FM 23-1.

19. Infantry Squad Battle Course (ISBC). The “standard” targetry and ancillary equipment quantities shown are recommended. Actual quantities must be based on training requirements and site adapted design.

a. Number of Lanes:	Standard: <u>  1  </u>	Actual:_____
b. RETS Equipment:	Standard:	Actual:
ITM	<u>  28*  </u>	_____
IMTC	<u>    6  </u>	_____
THMTG	<u>    6  </u>	_____
AMTC	<u>    1  </u>	_____
JBL	<u>   39  </u>	_____
JBH	<u>    6  </u>	_____
TIU	<u>   17  </u>	_____
DBB	<u>    1  </u>	_____
DTA	<u>    -  </u>	_____
IHFS	<u>   22  </u>	_____
NMFS	<u>   22  </u>	_____
ATKS	<u>   17  </u>	_____
RCS	<u>    1  </u>	_____

- c. RETS Emplacement Locations (CEHNC 1110-1-23):
- (1) SIT:   22   per lane
- (a)   -   meters
- (b)   -   meters
- (c)   -   meters
- (2) MIT:   6   per lane
- (a)   -   meters
- (3) MAT:   1   per (lane) (range)
- (a)   -   meters
- (4) SAT:   6   per (lane) (range)
- (a)   -   meters
- (5) MSD:  10   per (lane) (range)

*\*ITM’s = Stationary Infantry Target Emplacements plus Moving Infantry Target Emplacements.*

20. Infantry Platoon Battle Course (IPBC). The “standard” targetry and ancillary equipment quantities shown are recommended. Actual quantities must be based on training requirements and site adapted design.

a. Number of Lanes:	Standard: <u>  1  </u>	Actual:_____
b. RETS Equipment:	Standard:	Actual:
ITM	<u>  57*  </u>	_____
IMTC	<u>   14  </u>	_____
THMTG	<u>    6  </u>	_____
AMTC	<u>    1  </u>	_____
JBL	<u>   58  </u>	_____
JBH	<u>   14  </u>	_____
TIU	<u>   15  </u>	_____
DBB	<u>    2  </u>	_____
DTA	<u>    -  </u>	_____
IHFS	<u>   43  </u>	_____
NMFS	<u>   43  </u>	_____
ATKS	<u>   15  </u>	_____
RCS	<u>    1  </u>	_____

- c. RETS Emplacement Locations (TC 25-8; CEHNC 1110-1-23):
- (1) SIT:  43   per (lane) (range)
- (a)   -   meters
- (b)   -   meters
- (c)   -   meters
- (2) MIT:  14   per lane
- (a)   -   meters
- (3) MAT:   1   per (lane) (range)
- (a)   -   meters
- (4) SAT:   6   per (lane) (range)
- (a)   -   meters
- (5) MSD:   8   per (lane) (range)

*\*ITM’s = Stationary Infantry Target Emplacements plus Moving Infantry Target Emplacements.*

Part VII

Range Standard Equipment Matrix (RSEM) and Component Calculation Factors

**1. How To Use the RSEM:** The RSEM identifies specific authorized quantities of RETS/RETS-associated hardware for each standardized range. The quantities listed are considered a ceiling (maximum) amount for each range project. A user may plan/request lesser quantities based on resource restrictions/ factors such as reduced real estate (range area), funding and/ or unit through put levels. If greater quantities are desired for a particular project, written justification and approval must be submitted through and endorsed by MACOM headquarters to RTSD Program Coordinator.

RANGE	LNS	ITM	IMTC	AMTC	THMTG	TIU	JBL	JBH	DTA	T3D	NMFS	IHFS	ATKS
AFF	32	96	-	-	-	-	96	-	-	96	-	-	-
ARF	16	112	-	-	-	-	112	-	-	112	32	32	-
MRF	16	144	-	-	-	-	144	-	-	144	32	32	-
SFF	4	48	-	-	-	-	40	8	-	44	-	-	-
MG TRNS:													
M60	10	80	-	-	-	-	80	-	80	160	-	-	-
M2	10	50	-	-	-	-	50	-	50	100	-	-	-
SAW	10	90	-	-	-	-	90	-	60	150	-	-	-
MPMG	10	150	-	-	-	-	150	-	120	270	-	-	-
CPQC	15	105	-	-	-	-	105	-	-	105	-	-	-
MPRC-H	3	198	45	12	60	72	225	45	18	216	140	-	72
MPRC-LI	1	199	46	9	37	46	199	46	18	217	140	45	46
MPTR:													
TNK/BFV	1	50	-	4	20	24	74	-	12	56	25	50	24
BFV	1	34	-	2	12	14	48	-	8	38	17	34	14
TGR	1	26	-	4	36	40	66	-	6	32	-	-	40
AATLFR	-	-	-	2	4	6	6	-	-	-	-	-	6
ISBC	-	28	6	1	6	17	39	6	-	28	22	22	17
IPBC	-	57	14	1	6	15	58	14	-	71	43	43	15

One RCS/ERETS is authorized per small arms range. Two RCS/ERETS are authorized per collective/tank range.

**2. How To Use The Component Calculation Factors:** The following formulas are used by AMCCOM to determine/ verify the standard equipment quantities used on a given RETS range. use these calculation factors in conjunction with the Range Standard Equipment Matrix.

- a.      # ITM = # SIT + # MIT
  
- b.      # JBL = # SIT + # SAT + # MAT + # MSD
  
- c.      # JBH = # MIT
  
- d.      # ATKS = # SAT = # MAT = # MSD
  
- e.      # TIU = # H/W MAT + # H/W SAT
  
- f.      # T3D = # SIT + # MIT + # DTA
  
- g.      # RCS = 1/RANGE (small arms ranges)  
          # RCS = 2/RANGE (collective training ranges)
  
- h.      # RCS ADPTR = 1/INSTALLATION
  
- i.      # TJB & SDA = 1 PER CONTROL TOWER
  
- j.      # THMTG = # SAT
  
- k.      # AMTC = # MAT

**3. LEGEND:**

- LNS     =   lanes
  
- ITM     =   infantry target mechanism
  
- IMTC    =   infantry moving target carrier
  
- AMTC    =   armor moving target carrier
  
- THMTG=   target holding mechanism, tank gunnery
  
- TIU=     target interface unit
  
- JBL=     junction box low
  
- JBH=     junction box high
  
- DTA     =   double target arms
  
- T3D     =   target, three dimensional
  
- NMFS    =   night muzzle flash simulator
  
- ATKS    =   armor target kill simulator
  
- RCS     =   range control station
  
- TJB=     tower junction box
  
- SDA     =   signal distribution assembly
  
- DBB     =   data breakout box
  
- MSD     =   mortar simulation device

Part VIII  
Standard Range Sample Size Matrix

1. General. RTSD plans, coordinates, and conducts Construction Compliance Inspection (CCI) and Target Interface Inspections (TII) during the construction phase of RETS range projects as a part of Qualitative Assurance task of the Range Modernization Program. participation in these activities include the customer (user), appropriate COE district and MCA contractor, COE Huntsville, MACOM, and AMCCOM/Target Installation contractor representatives. Proposed RETS and RETS-related equipment emplacements and interface points are examined on the range to determine operability and acceptability to standards and specifications.
2. How To Use This Matrix. A representative sampling of the various emplacements and interface points are inspected by the CCI or TII team. While no specific quantities of each type emplacement/interface point are required for inspection, RTSD personnel generally follow MIL-STD-105D guidance and the numbers listed below. Project officers and other team members may adjust the sample size of initial inspection results are exceptionally good or exceptionally poor.

Range Type:	Number & Type Equipment Emplacements To Review:				
	SIT	MIT	AMTC	SAT	TOWER
	-	-	-	-	*
AFF	20	-	-	-	1
ARF	23	-	-	-	1
MRF	28	-	-	-	1
SFF	12	-	-	-	1
MG TRANS:					
M60	8	-	-	-	1
M2	8	-	-	-	1
SAW	13	-	-	-	1
MPMG	28	2	-	-	1
CPOC	20	2	-	-	1
MPRC-H	28	8	12	13	1
MPRC-LI	28	8	9	8	1
MPTR:					
TANK/BFV	8	-	4	5	1
BFV	6	-	2	4	1
TGR	5	-	4	7	1
AATLFR	-	-	2	4	1
ISBC	4	2	1	2	1
IPBC	7	3	1	2	1

\* (RCS, SDA, TJB)  
NOTE: SAMPLE 40% OF AVAILABLE DBBs ON SITE (IF APPLICABLE )

GLOSSARY

AAR.....	After Action Review	CPQC .....	Combat Pistol Qualification Course/Combat Pistol Range	H/W .....	Hard-Wired
AC .....	Active Component	CTC .....	Combat Training Center	ICARUS .....	Integrated Combined Arms Range Utility Site
ACE.....	Army Chief of Engineers	CTDR .....	Commercial Training Device Requirement	ICM.....	Improved Conventional Munitions
AE.....	Architect Engineer Firm	CTF .....	Combat Training Facility	IHFS .....	Infantry Hostile Fire Simulator
AFF.....	Automated Field Fire	CTT .....	Collective Training Theater	ILS .....	Integrated Logistic Support
AMC.....	US Army Materiel Command	3D.....	Three-dimensional	IMTC.....	Infantry Moving Target Carrier (RETS)
AMCCOM...	U.S.Army Armament, Munitions, and Chemical Command	DA.....	Department of the Army	IOC.....	Initial Operating Capability
AMIM.....	Army Modernization Information Memorandum	DBB.....	Data Breakout Boxes	IPR .....	In-Process Review
AMRP.....	Army Master Range Plan	DEH .....	Directorate of Engineering and Housing	IRFSS .....	Installation Range/Training Facility Survey Sheet
AMTC.....	Armor Moving Target Carrier	DPT .....	Directorate Plans and Training	ITAM .....	Integrated Training Area Management
APC .....	Armored Personnel Carrier	DPTM.....	Director Plans, Training, and Mobilization	ITM .....	Infantry Target Mechanism (RETS)
AR .....	Army Regulation	DPTS .....	Director Plans, Training, and Security	ISBC.....	Infantry Squad Battle Course
ARF .....	Automated Record Fire	DTA.....	Double Target Arm	IPBC.....	Infantry Platoon Battle Course
ARTEP .....	Army Training and Evaluation Program	EMG.....	Electro-magnetic Gun	JBH .....	Junction Box High
ATKS.....	Armor Target Kill Simulator	EOD .....	Explosive Ordnance Disposal	JBL .....	Junction Box Low
ATSC.....	Army Training Support Center	ERETS.....	Enhanced Remoted Target System	JRTC .....	Joint Readiness Training Center
ATTS .....	Automatic Tank Target System	ESSLR.....	Eye-safe Simulated Laser Rangefinder	LAW.....	Light Antitank Weapon
BATS.....	Ballistic Aerial Target System	EUSA .....	Eighth US Army	LITR.....	Low-Cost Indirect Fire Training Round
BCTP .....	Battle Command Training Program	FAA.....	Federal Aviation Administration	LTA.....	Local Training Area
BFV .....	Bradley Fighting Vehicle	FAST .....	Fully Automated Scorable Target	LTAAV .....	Local Training Area Assistance Visit
BMP.....	Soviet Infantry Fighting Vehicle	FDR (C).....	Final Design Review (Conference)	MACMOUT .....	Attack (or Assault) Course
BOIP.....	Basis of Issue Plan	FM.....	Field Manual, Frequency Modulated	MACOM .....	Major Army Command
CAC.....	Combined Arms Center	FORSCOM .....	United States Army Forces Command	MAFIS.....	Mobile Automatic Field Instrumentation System
CACDA .....	Combined Arms Combat Development Activity	FP .....	Firing Position	MAT.....	Moving Armor Target Emplacement
cal .....	Caliber	FST .....	Future Soviet Tank	MAW.....	Medium Antitank Weapon
CALFEX.....	Combined Arms Live Fire Exercise	FTX .....	Field Training Exercise	MCA.....	Military Construction, Army
CB.....	Control Box	FYRDP .....	Five Year Range Development Plan	MCTF.....	MOUT Collective Training Facility
CCI .....	Construction Compliance Inspection	G3.....	Assistant Chief of Staff, G3, Operations	METL.....	Mission Essential Task List
CDR.....	Concept Design Review, Critical Design Review	GLLD .....	Ground Laser Locator Designator	MFP.....	Materiel Fielding Plan
CEHNC.....	Corps of Engineers, Huntsville Division	GTA.....	Garrison Training Area	MILES.....	Multiple Integrated Laser Engagement System
CERL.....	Construction Engineering Research Laboratory	GTL.....	Gun-Target Line	MIT .....	Moving Infantry Target Emplacement
CEV .....	Combat Engineer Vehicle	HAW .....	Heavy Antitank Weapon	MOLS.....	Multiple Object Location System
CJB .....	Cable Junction Box	HE .....	High Explosive	MOS .....	Military Occupational Specialty
CMTC.....	Combat Maneuver Training Center	HQDA ODCSOPS.....	HQ Department of the Army, Office of the Deputy Chief of Staff for Operations and Plans (agency responsible for the Range Modernization and Standardization Program).	MOUT.....	Military Operations on Urbanized Terrain
COE.....	Corps of Engineers			MPMG .....	Multipurpose Machine Gun
COFT.....	Conduct of Fire Trainer			MPRC-H .....	Multipurpose Range Complex-Heavy

MPRC-LI .....Multipurpose Range Complex-Light  
MPTR ..... Multipurpose Training Range  
MRF..... Modified Record Fire  
MRIS ..... Modernization Resource Information Submission  
MSD ..... Mortar Simulation Device  
MTA .....Major Training Area  
MTP.....Mission Training Plan  
MUR.....Multi-Use Range  
NGB..... National Guard Bureau  
NMFS ..... Night Muzzle Flash Simulator  
NOHD..... Nominal Ocular Hazard Distance  
NSN .....National Stock Number  
NTC ..... National Training Center  
OCE..... Office, Chief of Engineers  
OMA.....Operations and Maintenance, Army  
OMARNG..... Operations and Maintenance, Army National Guard  
OMAR .....Operations and Maintenance, Army Reserve  
OPA ..... Other Procurement, Army  
OPTEMPO.....Annual Operating miles/hours for system in a particular unit required to execute the commander’s training strategy. It is stated in terms of miles/hours for the major system in a unit; however all equipment generating significant operating and support cost has an established operating tempo.  
ORD..... Operational Requirements Document  
OSD ..... Office of the Secretary of Defense  
OSD-PIF.....Office of the Secretary of Defense Productivity Investment Funding  
PARR..... Program Analysis and Resources Review  
PCIP..... Productivity Capital Investment Program  
PDB ..... Project Development Brochure  
PDD .....Position Detector Device  
PDIP ..... Program Development Increment Package  
PDR .....Preliminary Design Review  
PECIP .....Program Enhancing Capital Investment Program  
PERT .....Program Evaluation and Review Technique  
PGS..... Precision Gunnery Simulator  
PLD ..... Position Location Device  
PM TRADE .. Project Manager, Training Devices (Materiel Developer)

PN..... Project Number  
POM ..... Program Objective Memorandum  
PRIME.....Precision Range Integrated Maneuver Exercise  
PTA ..... Plastic Training Ammunition  
QRIP.....Quick Return on Investment Program  
RAP.....Rocket-Assisted Projectile  
RAV ..... Range Assistance Visit  
RC ..... Reserve Component  
R/C ..... Radio/Controlled  
RCMAT..... Radio-Controlled Miniature Aerial Target  
RCO..... Range Control Officer  
RCS ..... Range Control Station (RETS)  
RDP .....Range Development Plan  
RETS ..... Remoted Target System  
RFA .....Rimfire Adapter  
RFMG..... Range Facility Management Guide  
RFMSS ..... Range Facility Management Support System  
RMCS..... Range Management Control System  
ROC..... Required Operational Capability  
RPB ..... Range Prioritization Board  
RPG .....Rocket-Propelled Grenade  
RPRB.....Range Project Review Board  
RSEL ..... Range Standard Equipment List (RETS Targetry)  
RTSD.....Ranges, Targets and Standards in Training Commission Directorate.  
SAAD ..... Small Arms Air Defense  
SACON..... Shock Absorbing Cellular concrete  
SAT .....Stationary Armor Target Emplacement  
SAW .....Squad Automatic Weapon  
SAWE.....Simulation of Area Weapons Effects  
SDAD ..... Surface Danger Area Diagram  
SDZ .....Surface Danger Zone  
SEL..... Standard Equipment List (RETS Targetry)  
SETA .....Systems Engineering Technical Assistance  
SFF ..... Sniper Field Fire  
SIMNET .....Simulation Networking  
SIT.....Stationary Infantry Target Emplacement

SOP ..... Standing Operating Procedure  
SOW..... Statement of Work  
SRT ..... Subcaliber Rocket Trainer  
SRTS .....Scaled Range Target System  
T3D ..... Target Three-Dimensional  
TADSS ..... Training Aids, Devices, Simulations and Simulators  
TSC ..... Training Support Center  
TAV ..... Training Assistance visit  
TB ..... Technical Bulletin  
TC ..... Training Circular  
TDR.....Training Device Requirement  
THMTG..... Target Holding Mechanism-Tank Gunnery (RETS)  
TII ..... Target Interface Inspection  
TIU..... Target Interface Unit  
TM ..... Target Mechanism, Technical Manual  
TOE..... Table of Organization and Equipment  
TOW..... Tube-Launched, Optically Tracked, Wire-Guided Missile  
TPDC ..... Training Performance Data Center (DOD, Orlando)  
TRADOC..... United States Army Training and Doctrine Command  
TRAMEA .....TRADOC Management Engineering Activity  
TSV ..... Through-sight Video  
TT VIII..... Tank Table VIII (Tank Crew Qualification Course)  
TT XII ..... Tank Table XII (Tank Platoon Qualification Course)  
TWGSS ..... Tank Weapons Gunnery Simulation System  
UCOFT..... Unit Conduct of Fire Trainer  
USARPAC..... United States Army Pacific  
USAREUR ..... United States Army Europe  
UTS ..... Universal Target System  
V ..... Volt  
VAC ..... Volts Alternating Current  
VDC ..... Volts Direct Current  
Viper..... Air Defense Weapon System (Surface to Air)  
Weaponeer..... Indoor M16A1 Remedial Rifle Marksmanship Trainer  
WET ..... Weekend Training  
WRPRB .....Working Range Project Review Board  
WWRC ..... World-Wide Range Conference